

ART. VII.—*On the Murray River Cod, with particulars of Experiments instituted for introducing this Fish into the River Yarra-Yarra.* By EDWARD WILSON, Esq.

[Read before the Institute 8th April, 1857.]

MR. PRESIDENT AND GENTLEMEN,—It is with some diffidence that I present myself before the members of the Philosophical Institute, to read a short paper descriptive of a little experiment which I have lately been making for the introduction of the fish known as the Cod-perch of the Murray into the river Yarra. I am no naturalist, nor scientific in any other way; my pursuits having long lain in very different directions. These remarks, then, must be considered as a mere popularly treated sketch of a scheme which I have good hopes has been tolerably successful, and which, if successful, will be thought to contain, I trust, some elements of interest.

For a long time I have been impressed with an idea of the singular disproportion between the endless *variety* and lavish *profusion* of the natural productions of the earth, and their unequal and even eccentric *distribution*. In a newly settled country like this, the consideration of this subject is particularly important. Our progress in equalizing the distribution of natural productions has not been altogether unsatisfactory, but I think that our comparative success ought rather to have the effect of urging us to new and more vigorous endeavours, than of leading us to become contented with what has been already done. How few of the present productions of the Colony, upon which we are mainly dependent for our comfort and enjoyment, were placed here naturally, and without the special interposition of man! And yet how astonishingly successful their introduction has been! How contracted the list of indigenous productions! How large the catalogue of those already at our service! In glancing down the list it is worth while to test their respective usefulness by a constant consideration of the question, how far we should now be inclined to part with any one of them. We think little of them, probably, now we have them. Let us consider how we should get on without them. The sheep, for instance, is not indigenous; and yet what would be the effect upon this colony of the entire annihilation of the sheep? The ox is not indigenous, yet how should we recon-

cile ourselves to be deprived of beef, or milk? The horse is not indigenous, yet how could we now spare that useful servant? The dog is not indigenous, nor the pig, the goat, the cat, the domestic fowl, the common pigeon, the duck, goose, and turkey. Strike one of these from our list now, and we should to a greater or less extent miss it.

And I may here remark that we are, perhaps, inclined to be guided too much by considerations of *profit* in many of these things, rather than by considerations of the enjoyments afforded by them irrespective of those of a pecuniary nature. We speak respectfully of the sheep for instance, because we are assured by our statistical friends that it enables us to produce an export of £1,200,000 to £1,500,000 annually. But if the sheep were taken entirely from us, the loss would be but imperfectly represented by a failure of exports to the amount I have named. What would become of the employment afforded to thousands by the attention required by this animal? How should we miss the endless variety of roast and boiled, and baked, the joints and chops and savory stews, which form no item of the export?

And if we can enumerate such a list of imported luxuries as the above in the animal kingdom, we have amongst our vegetable production a still wider range. How should we get on without our wheat, barley, oats, maize, potatoes, turnips, cabbage, lettuce, carrots, peas, beans, beet, and a hundred other things not in any instance indigenous, and yet successfully introduced, thoroughly established, and extensively used and appreciated amongst us? Then the apple, pear, peach, plum, grape, mulberry, cherry, quince, apricot, gooseberry, currant, melon, strawberry, raspberry, and fig! What a world of wholesome enjoyment is contained in such a list as this! What if we were called upon to resign all these, and fall back upon the native quandong and the little yew-berry which goes by the name of the native cherry!

What I wish particularly to urge is, that, having done so much as we undoubtedly have done in so short a time, we should be encouraged to still more energetic efforts. With a virgin country, an Italian climate, and British institutions to lend force and intelligence to our endeavours, and with a most extensive commerce ramifying over the whole globe, I hold the very highest conceptions of the capability of this country for very vast and varied improvements and additions, and I wish to see every possible step taken to give scope to its utmost possibilities, and that without the loss of one un-

necessary day. In looking abroad over the earth, Nature seems to have been lavish in the supply of her various gifts, but singularly capricious in their adjustment; or rather she has properly and kindly left to man the interesting and agreeable task of supplementing her own efforts, of discovering by experiment and the action of his own intellect how far the gift itself may be multiplied, extended, and improved.

I must here confess my profound sorrow that no Government that this Colony has yet possessed has shown much inclination to do anything to further or assist this interesting process. It has long since been incessantly urged upon them that agriculture should be made a State department, and that experimental farms and gardens should be established, in which every plant, as well as every animal, that could possibly be found suitable to the colony should be fairly tested, and introduced by direct contact to the inhabitants at large. I trust this will not long be so. It is a duty, whether in our individual or collective capacity, to endeavour to multiply sources of comfort, enjoyment, and profit; and I cannot conceive why a duty at once so sacred and so agreeable should be so frequently ignored by those who have the power most signally to serve us.

It was by convictions such as these that I have been led to endeavour to reduce to practice what I think must be allowed to be unquestionably true in theory. We are rather given to *talk* too much, and *do* too little; and I confess that I have long yearned to secure practical effect to what, without individual action, is rather too apt to dwindle into resultless theory. People in this Colony have been talking, ever since I came to it, of introducing the alpaca. The last news from Adelaide acquaints us with the fact that, while we have talked, a Mr. Haigh of that city has *acted*, and has just succeeded in importing four healthy animals of this kind. Perhaps the example may be of service. But I for one must confess my little appreciation of the man of many words and little deeds.

If any of those I now address will take boat at Princes Bridge, and pull up as far as the river is navigable, they will observe on most fine days, but particularly in the morning and evening, and on holidays, an almost continuous line of anglers, of all sorts, sizes, and conditions of men. The only fish these sportsmen catch, consist, I believe, of a few herrings and black fish, with an occasional eel. The idea has often struck me that it is a great pity that they have not

better game, and that the man would do them a great kindness, and not only them, but the countless generations who will come after them, who would put a better prey within their reach than a herring of a few inches long, or a black fish, which rarely reaches a size constituting it properly presentable at table. My thoughts naturally turned immediately upon the Murray River Cod, a fish which grows to an enormous size, is very delicate, palatable, and wholesome; but which, from some unknown reason, is only found in those waters which flow towards the north or west; never in those flowing to the south or east. I could see no reason why this natural law should be irrevocable, and I have for a very long time desired to try the experiment whether this valuable fish would not live and thrive as well in the Yarra, as in any of the waters in which it has been so mysteriously placed.

For a considerable time I was at a loss how to proceed. My first idea was to get them down by some rapid conveyance from the nearest point of the Loddon or Campaspe, in both which rivers they abound. But I did not feel justified in incurring a very heavy expense, and I also distrusted the length of the journey, and the probable exhaustion of the water in which it was necessary that they should be conveyed. By degrees I came to the conclusion that the best plan would be to trace up the tributaries of the Yarra and Murray respectively to the highest point at which those tributaries could be found united by a practicable road, and to leave to the fish themselves the duty of finding their way down to the larger stream. The King Parrot Creek, in which the fish is readily caught, and which discharges itself into the Goulburn just above Seymour, and the Plenty River which runs into the Yarra above Heidelberg, seemed to me the most suitable for the purpose, provided the road across the ranges were available for a light cart. On a recent visit to Yan Yean, I broached the subject to Mr. Sherwin, one of the oldest settlers in that neighbourhood, and got some very valuable information from him. And here I must gratefully acknowledge the services of that gentleman throughout the prosecution of my experiment. From the day I first mentioned it, Mr. Sherwin has entered into it with the greatest enthusiasm, has warmly co-operated with me in every way, and, residing near the immediate scene of action, has been able to render me invaluable assistance, Mr. M'Lellan, too, a settler on the banks of the King Parrot has lent me very important aid. I found that there was a very passable road

between the streams, of not more than seventeen or eighteen miles, and I immediately sent up an expedition to test the experiment fairly. That expedition was of a very modest character,—consisting of a couple of men, a horse and spring-cart, with tent, water-tight box, rations, and fishing tackle—almost ludicrously inexpensive as compared with the object at which I aimed, or as the result of combined action; although quite sufficiently costly for an individual. I mention this as an illustration of the ease with which things are done if we each perform our share of the task, compared with the difficulty in the case of a single individual.

After sundry little mishaps, in the way of horse-losing, &c., by which all such experiments are naturally beset, I heard from my man, that on the 6th February he had got safely across with nineteen live fish, and had put them into the Plenty, a mile or two above the township of Whittlesea. I immediately wrote off to Mr. Sherwin, asking several questions of some interest to the successful issue of the experiment, and by way of giving you a correct idea of its progress, I cannot do better than introduce an occasional extract of the letters received from that gentleman. I wrote up to ask particularly whether Mr. Sherwin had himself seen the fish put in the Plenty, whether he was certain they were the true Murray River cod, and whether when put in they swam vigorously away as if life-like and healthy; or lingered on the surface, as is the case with a weakly, diseased, or disabled fish. I must remark, here, that I asked these questions in no distrust of the man who has had charge of the experiment, for it is but justice to bear my testimony to the great zeal, intelligence, and fidelity he has exhibited throughout. But about experiments like these there should be no room left for any doubt whatever. If, as I believe and hope, these fish are to prove the progenitors of countless thousands, which in their own good time will make their way throughout the waters of the Yarra and all its tributaries, the circumstances of their introduction to the streams on this side of the dividing range should be unquestionable.

On the 16th February Mr. Sherwin writes me in reply to my questions—“1st. Whether the fish are actually seen put into the river? Yes; I was present and assisted to put them into the river, and a large water-hole through which the river constantly flows. 2ndly. Are they really the Murray cod? Fourteen were Murray cod, and five were

“ bream. 3rdly. When put into the water did they swim vigorously away? The majority of them did. Some appeared sickly, and after watching them a short time, five codfish and one bream died; indeed, four were all but dead when they arrived. One bream died about four hours after they were put into the river, and three days subsequently I found one codfish dead in the hole and one bream in the river. There have, therefore, been seven deaths out of nineteen fish; but I am certain no more have died, as I have constantly watched both the river and the water-hole without having discovered any more either sick or dead, and I think that you have now living in the waters flowing to the south, nine codfish and three bream.” Mr. Sherwin goes on to say, “ The latter fish is a *fac simile* of the fish of the same name so common in the Bay, Saltwater River, and Werribee. From the general appearance of the fish and the number of deaths, I was of opinion that they had been confined too long, and advised George to make shorter trips, even though he brought fewer of them, and to feed the fish by throwing into his pen some maggotty meat, as some of them appeared to me to be suffering from starvation more than any other cause.”

After sundry further misadventures from floods and other causes, leading to the loss, at the King Parrot Creek, of a good many fish, Mr. Sherwin writes me again on the 25th February:—“ In my last I expressed fears that the zinc box had something in it deleterious to the lives of the fish, and I advised certain changes; first, that a cask with a scuttle should be substituted for the cistern; and second, shorter trips by at least three days. I am happy to inform you that these have been salutary changes, as the results show. George arrived here with nine cod and three bream (after an absence of four days), which, the instant they were put into the river, darted off vigorously and disappeared. I have constantly watched the place, both above and below, and have not found any dead. On the 23rd he came down again with another supply of twenty-eight fish—eighteen of which were cod, and ten bream, all strong, vigorous, and in beautiful condition, clean and bright, having the appearance generally of only having just been captured; and when put into the river they darted off instantly and disappeared in the deep water. I have watched constantly since, but have not found any yet either sick or dead.

“ These make a total now of forty-nine fish put into the river since the 6th, all of which I believe to be living and doing well.”

This you may easily conceive I looked upon as very good news—in fact the success of the experiment. I have little doubt that these would have been sufficient eventually to supply the waters flowing this way. But I was too pleased with the ease of the experiment to put a stop to it; and besides this I think that in all these attempts, it is very false economy to limit the operation to what may be barely sufficient for the purpose. If we attempt to supplement Nature, we ought to imitate her in one of her most striking attributes—*profusion*. If the thing be worth doing at all, let us take care to do it *well*.

On the 22nd March, Mr. Sherwin writes—

“ The last batch of fish we put into the Plenty brought the total number up to one hundred and seven, consisting of sixty-six Cod and forty-one Bream, out of which number I have an account of only ten deaths, namely, six Cod and four Bream. I have every reason to believe that we have at the present moment in the Plenty River sixty Codfish, and thirty-seven Bream, all living and doing well; and I think that after the batch that he will bring this evening for the reservoir, he may, as far as the supply to the southern waters is concerned, then close his labours; more particularly as the weather is beginning to break up. I said when I last had the pleasure of seeing you, that I read somewhere that a Codfish spawned 3,000,000 and upwards, and I find, on reference to a work I have, that a Codfish has been known to produce 3,600,000 eggs, while a Herring, weighing only four or five ounces, spawns from 21,000 to 36,000. If, therefore, only *two* of our ninety-seven Bream and Cod now living should spawn all right, we shall soon have all the waters flowing southward into the Bay teeming with myriads of the finest, and, for all domestic purposes, perhaps, the most useful fish in the world.”

I think that in the last remark my friend Mr. Sherwin probably allows his enthusiasm to run away with him a little. But it is only fair to mention that he is a native of Australia, that he has never been in England, and has, therefore, never had an opportunity of personally examining the claims to the very high character given to this fish,—of the herring, which affords sustenance and employment to thousands of people; of the true cod of Newfoundland, that supplies a

fishery—the rights of which have more than once nearly furnished a *casus belli* between the two most powerful countries in the world; or of that monarch of all fresh-water fishes—the noble salmon of the northern hemisphere.

About ten days ago I paid a visit to the scene of operations, and I found that the wet weather then prevailing was indeed bringing the experiment to a conclusion, as far as this season was concerned. In high cloud-attracting ranges like those of the Plenty, flying showers are at this time of the year almost incessantly occurring, and these make the surface of the ground so slippery, that, combined with the steepness of the ascents, it is almost impossible for a horse to keep his feet while drawing a heavy lead. My own old horse, although one of the worthiest and most staunch of his staunch and worthy race, had become so dismayed with the glassy surface of one particularly steep hill that he had twice refused it, and two loads of fine fish had consequently been returned to their native waters. I was not able even to fetch over one load to put into the Yan Yean Reservoir, the most splendid nursery for fish probably in the whole world; consisting of several miles of water, varying to five and twenty feet deep, and at present almost unoccupied by any kind of fish.

I desired my man, therefore, to concentrate his energies upon catching a few more, and endeavouring to bring them to town alive. In this he believes that he succeeded, but I fear that the quantity of water in which they were placed was too limited to support life in fish of such a size, and on the morning after arrival they were found to be all dead. I have kept one or two in brine, by way of giving an idea of the character of the fish. I have also a few salted specimens on the table.

The Murray River Cod is, in fact, a species of perch. It grows to an enormous size, takes a bait of worm, frog, or offal greedily, and is wholesome and palatable even when very large indeed. Mr. Sherwin tells me that he has himself caught one of 73 lbs. weight, and that his men once assured him they had caught one of 93 lbs. Mr. Sherwin saw the head, and felt convinced that they were speaking the truth. My friend Mr. Foxton tells me that he lived almost entirely upon them for several weeks, and that he has no doubt of their growing to that size. He recollects catching one that gave himself and one of his men a very hard job to drag it home along the grass, with a stick thrust through its gills. In Adelaide they are reported to have



been seen of 120 lbs. weight, and in size more resembling a porpoise than an ordinary river fish. Up to 20 or 30 lbs. weight they are very common. They are found along the whole course of the Murray and all its tributaries, even where dwindling into the most insignificant streams. And therefore I have no doubt of their forcing their way from the Plenty into the Yarra, and from it to all its minor branches. The Plenty at the place where they were put in is nearly as considerable a stream as the King Parrot Creek at the place where they were caught. It flows continuously through the whole summer into the Yarra, and although during the hot weather it is fordable at particular points, it abounds with deep holes, which constitute capital lurking-places for the fish during the drier months; and frequent freshets afford ample opportunity for their change of locality.

It will be perceived that although this paper professes to treat solely of the codfish I have made frequent mention of the bream, forty-one of which have accompanied the fish upon which we have principally concentrated our energies. Of this fish, Mr. Sherwin writes me,—“The bream is a fish “that I have never yet myself seen in the Murray, nor have “I ever seen it anywhere in fresh water till I saw them “caught in the King Parrot Creek, although common in the “bays and salt water rivers and creeks in different parts of “the coast. The bream, however, may be an inhabitant of “the different rivers to the north without my knowledge, as “I have only been upon them occasionally and for short “periods.”

In the course of my experiment I have been met by two or three considerations; upon the satisfactory solution of which a good deal of the practical success of the experiment appears to depend. In the first place, it struck me that, inasmuch as the enormous size to which this fish sometimes grows might be taken to indicate maturity, it was doubtful how far it would be likely to be in a condition to breed till that maturity was attained. In the second place I was anxious to know at what age the young ones, if produced, would be likely to have arrived at such a size as to be worth catching, or presentable at table. Thirdly, I was in doubt whether this was one of the periodically sea-seeking fishes, and if so, whether if it reach the Yarra it will be able to overcome such an obstacle as that presented at our falls, just above the Queen's Wharf. As to its readiness to breed, I received most satisfactory evidence from Mr. Sherwin who tells me

that several of those about six pounds weight which either died, or were so much injured by the hook as not to be worth preserving, were completely full of roe. And upon application to Professor M'Coy, that gentleman kindly furnished me with some information of a very pleasing nature indeed, as leading me to look for complete fructification of my scheme at a far earlier period than I had ever been sanguine enough to anticipate it. Professor M'Coy says, "I have no specific knowledge of the rate of growth of the *Grystes Peelii*, or Murray cod-perch, but analogy would lead me to expect that *one year* would grow a mature fish, able to breed, and probably of the smaller size you mention in your species. But the fact bearing perhaps most directly upon the difficulty you allude to (of hearing of fish of 93 lbs., and finding eggs in one of 6 lbs.) is unquestionable in all fishes, namely—that, unlike warm blooded animals, there is no limit to their growth. All fishes and reptiles continue to grow larger as long as they live, and their maturity and power of breeding is usually attained in the first year, at a comparatively small size when compared with the dimensions of old individuals." As to the prolific properties of the fish, Professor M'Coy's testimony is very cheering indeed—"No one that I know," he says, "has counted the eggs of the cod-perch, and the counting the European perch (which belongs to the different genus *Perca*) would not be applicable to your species. But here again a general fact may serve your purpose—that every fish has ten or twenty thousand times more ova in the roe than are required to keep up the average number of its kind. This is to allow for the enormous destruction of young ones by voracious fishes and other creatures which live on them. The men employed by the French Government to stock the large fish-breeding ponds for supplying the poor with food in many parts of France, find a small part of the roe of one fish sufficient to fill the largest inclosures."

If the cod breeds in the Yarra or Plenty, it seems likely to be pretty safe from very destructive enemies. They eat one another I am sorry to say, with great greediness; but escaping their fathers and mothers, and elder brothers and sisters, their numbers do not seem likely to be greatly decreased by the few herons, kingfishers, &c., which I fancy are almost the only enemies with which they will have to contend.

If they are a sea-seeking fish, I hope that nature will have

provided them with the same instinct for overcoming difficulties that she has furnished to the salmon and other river fishes which she compels periodically to seek the ocean. I am rather inclined to fancy that this is not the case, as Mr. Sherwin tells me that they are to be found far up the Murray at all seasons of the year, as, although they do not bite freely except during the warm weather, the aborigines seem able to catch one almost at any time. And as from the only possible outlet to the sea to some of the remoter tributaries of the Murray they would have to face a trip of probably over two thousand miles, I think it far more probable that they are a purely fresh water fish, and never migrate at all. In the event of getting some alive to Melbourne, I had intended to try what proportion of sea-water one of them would bear, or whether it would live in pure sea-water. Their premature death, however, prevented my subjecting their disposition to seek the sea to any such test. At the same time it is worth remarking that the only great obstacle in their way would be the pier above the Wharf. This obstruction is mainly artificial. It was placed there for the purpose of preserving the fresh water from the influx of the tide during the summer months, and as soon as the Yan Yean supply is completed it will become useless, and may probably at some day be altogether removed.

I have thus, Mr. President and gentlemen, endeavoured to lay before you a sketch of my experiment. If successful I think it will be allowed to be an interesting thing to have introduced to the waters of the Yarra a fish which I have proved to you sometimes attains nearly twice the weight of one of our ordinary sheep. I trust that the result of the experiment will be to place, at no very remote period, a new and wholesome delicacy upon the tables of Melbourne and its neighbourhood, and to furnish the anglers of our river-banks with a prey which may possibly give them some trouble to draw from its waters.

Personally I have no interest in the matter. I am no angler. I never caught a fish in the Yarra in my life, and most probably never shall catch one. If the cod ever should abound there, I may probably never taste it, for the time is coming in which I think it is unlikely that I shall remain a continuous resident in Australia. I have nearly completed my arrangements to give scope to a long-cherished desire to combine with the opportunity of seeing some of the more interesting countries in the world, the carrying out upon a

larger scale the particular kind of experiment which I have here narrated as a very small one. I make the remark here, because I know the value in any such experiment of that kind of co-operation and encouragement to which I have had occasion gratefully to allude in mentioning the names of Messrs. Sherwin and M'Lelland, and I am not so absurdly proud or self-confident as to fail to bespeak it. I believe that a man can scarcely adopt a more useful or delightful pursuit to which to devote his time, his attention, and his means, than one which enables him, even in a small way, to add to or extend the productions of the earth, to endeavour humbly to supplement Nature in the supply of the multifarious blessings which she sheds around us, and to multiply legitimate enjoyments amongst the people.

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ART. VIII.—*On the Supply of Water to the Town of Geelong.* By JOHN MILLAR, Esq., C.E., F.S.A., &c. *Engineer-in-Chief to the Geelong Water Commission.*

[Read before the Institute 6th May, 1857.]

HAVING had the honour of being appointed Engineer to the Water Commission of Geelong, and seeing that the supply of life's great essential, pure and unadulterated water, to the inhabitants of any portion of this colony, is so intimately interwoven with the well-being of all, being a part and parcel of our vital interests, so essentially necessary to the enjoyment of perfect health that it must be a subject of universal importance, I therefore propose placing before the Institute a general summary of what has been done under my commission towards the accomplishment of that object, and the attendant results of my labours.

I am perfectly sensible of the risk I incur in making statements on this subject, even when based on a sound theory, coupled with long practice, and strengthened by such statistical information as I may have been enabled to collect; aided as I may be by all this, yet statements of a startling nature may appear incredible to those whose attention has never been directed to such matters; if any such should doubt the accuracy of my conclusions, I can only say that they rest on facts which I conceive to be incontrovertible.